

Report on Emerging Contaminants in the Tidal Delaware River

DRBC Toxics Advisory Committee Meeting
May 7, 2012

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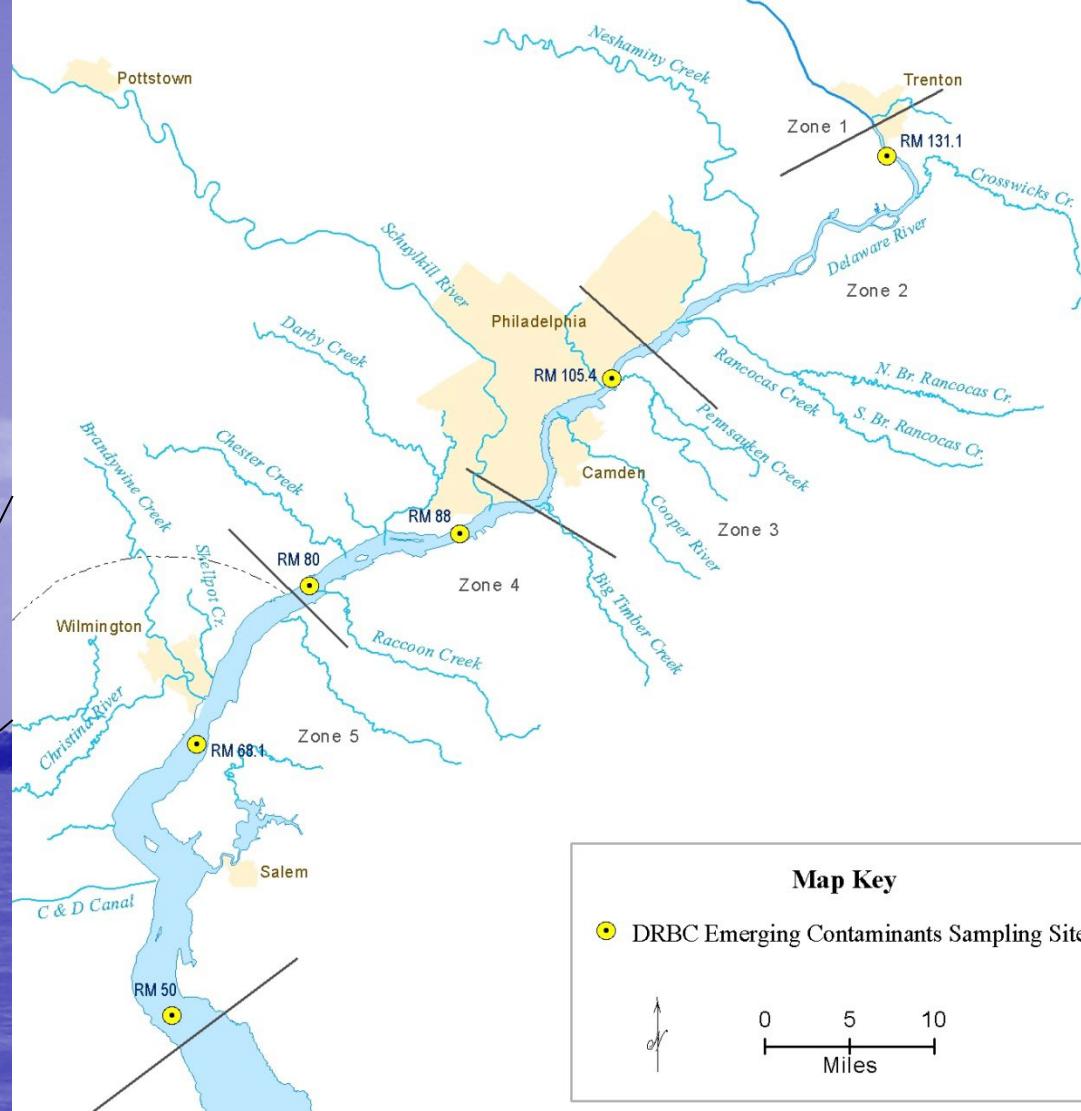
- Goals: Evaluate ambient water for unregulated contaminants of increasing environmental and human health concern
- Participants: DRBC and Axys Analytical Laboratories

Contaminants of Emerging Concern

- Pharmaceuticals and Personal Care Products (PPCP)
- Hormones
- Stain repellants/non-stick surfaces [PFC]
- Flame Retardants [PBDE]
- Surfactants [NP]
- Plasticizers [bis-phenol A]



Delaware River Basin



Ambient Water Sampling
2007, 2008 & 2009



Results

- PBDE were measured in pg/L to ng/L concentrations with homolog distributions similar to those observed in other North American locations. Because of the low levels found in water, future monitoring of PBDE by the DRBC will focus on bioaccumulation in fish tissue.
- Nonylphenol levels did not exceed current United States Environmental Protection Agency national water quality criteria.
- BPA not detected in ambient water (DL 0.05 ng/L)
- Natural and synthetic hormones were detected in ng/L levels.



Ambient Water Surveys in the Tidal Main Stem Delaware River

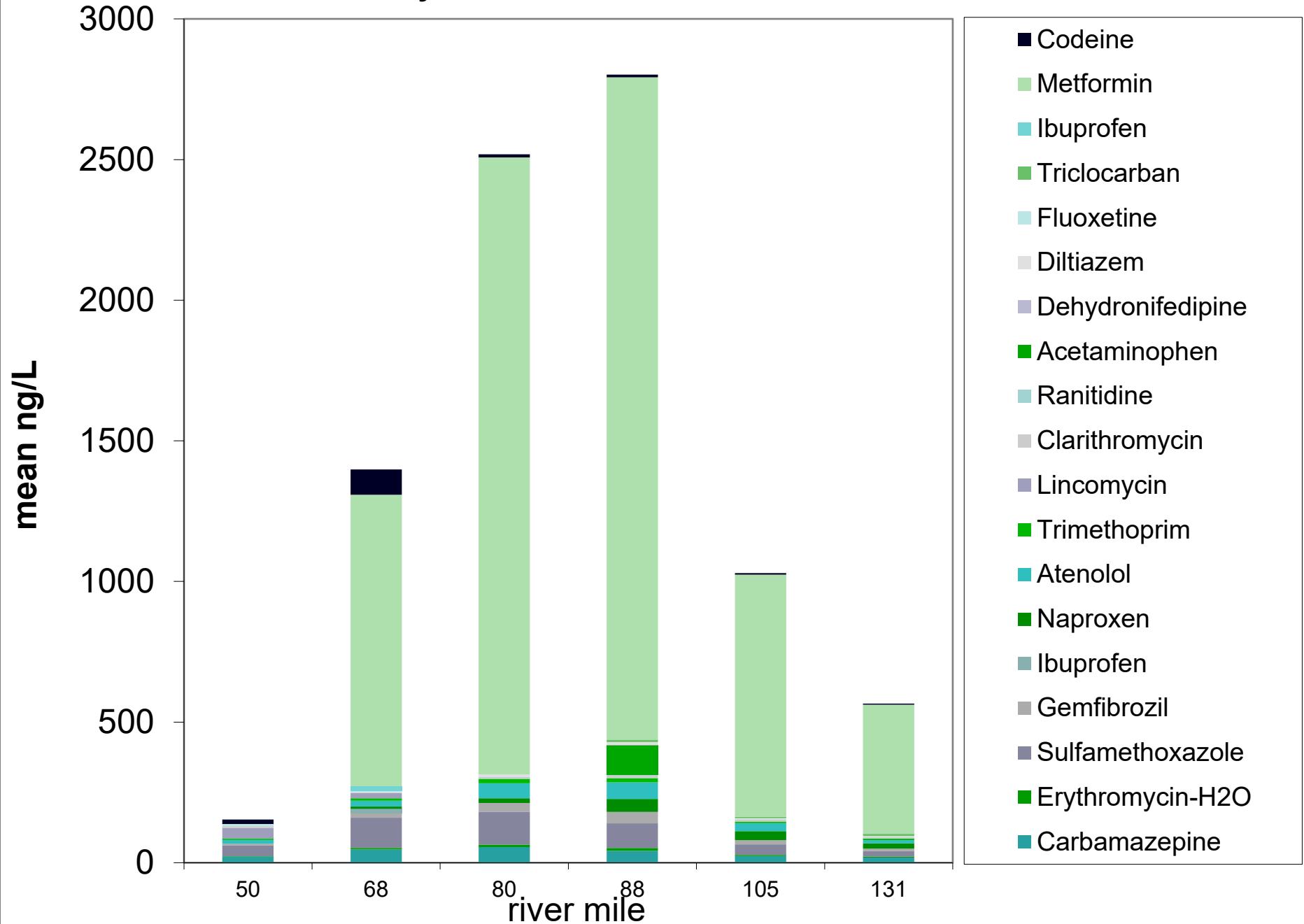
	2007 # of analytes / # detected	2008 # of analytes / # detected	2009 # of analytes / # detected
PFC LC/MS/MS	13/11 MLA060 – Rev03	13/11 MLA060 – Rev04	13/11 MLA060 – Rev07
PPCP LC/MS/MS USEPA 1694 plus extended list of analytes	54/21 MLA052 – Rev04	72/49 MLA052 – Rev04	119/46 MLA075 – Rev04
Sterols and Hormones	24/6 MLA055 – Rev02 GC/LRMS	27/11 MLA068 – Rev01 GC/LRMS	17/2 Hormones only MLA072 – Rev02 LC/MS/MS
NP and NPE GC/MS	3/2 MLA004 – Rev04	4/1 MLA004 – Rev05	4/2 MLA004 – Rev05
bis-phenol-A LC/MS/MS	Not monitored	1/0 MLA059 – Rev03	1/0 MLA059 – Rev04
PBDE HRGC/HRMS USEPA 1614	46/24 MLA033-Rev03	Not monitored	Not monitored
Carbamate Pesticides LC/MS/MS	21/7 MLA-047 Draft	Not monitored	Not monitored

Criteria for Prioritization of PPCP

- Environmental Concentration
- Toxicity (ecological and human)
- Physicochemical properties
- Analytical feasibility (all but Atenolol listed in EPA Method 1694)
- Consumption/sales
- Degradation/persistence

de Voogt *et al.*, 2009, Water Sci & Technol
Kostich and Lazorchak, 2008, Sci Total Environ
Ottmar *et al.*, 2010, Bull Environ Contam Toxicol

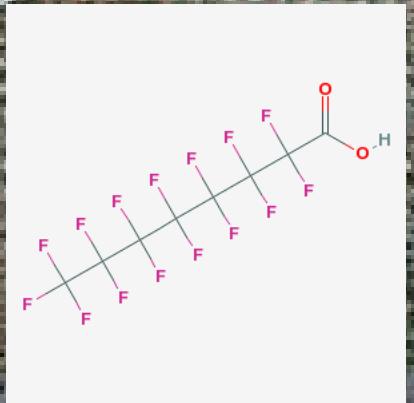
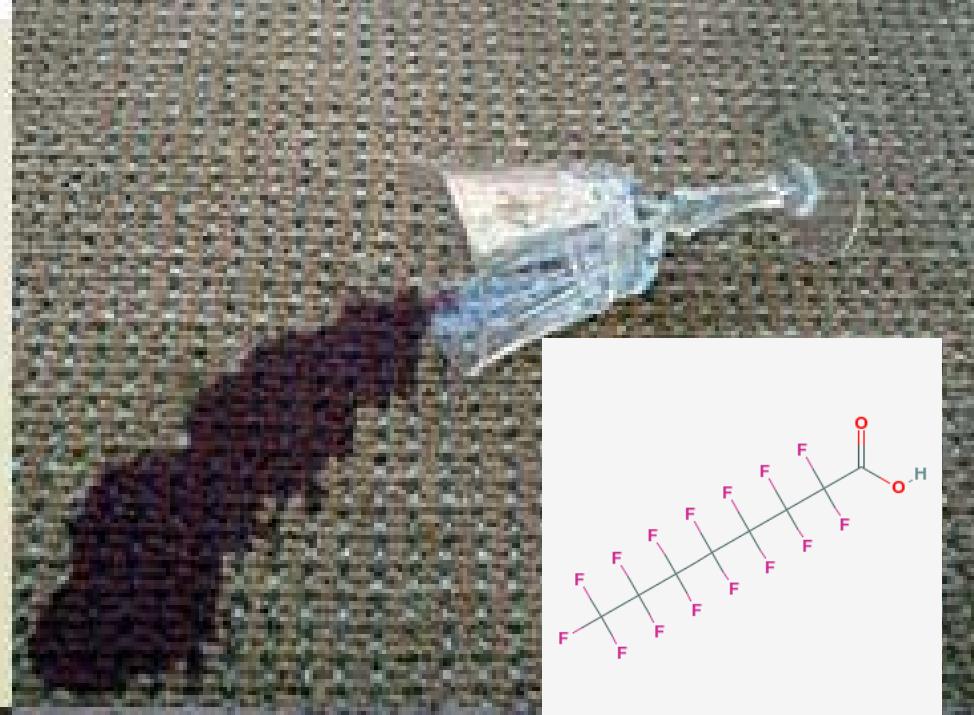
Priority PPCP in Tidal Delaware River





Summary – PPCP

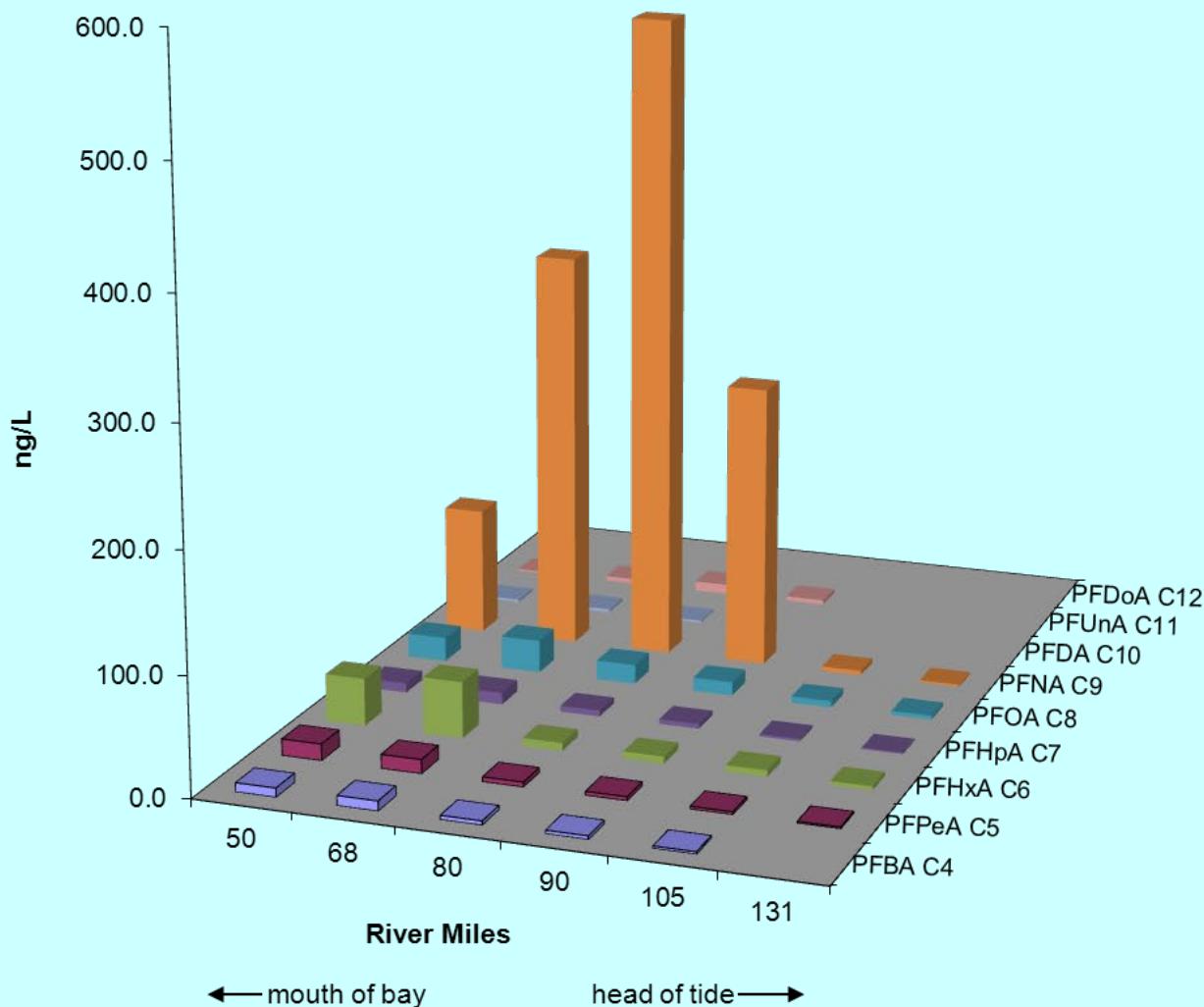
- Similar contaminants present in other fresh and estuarine surface waters with exception of codeine and metformin.
- Nineteen priority PPCP proposed for study in Delaware Estuary.



Perfluorochemicals

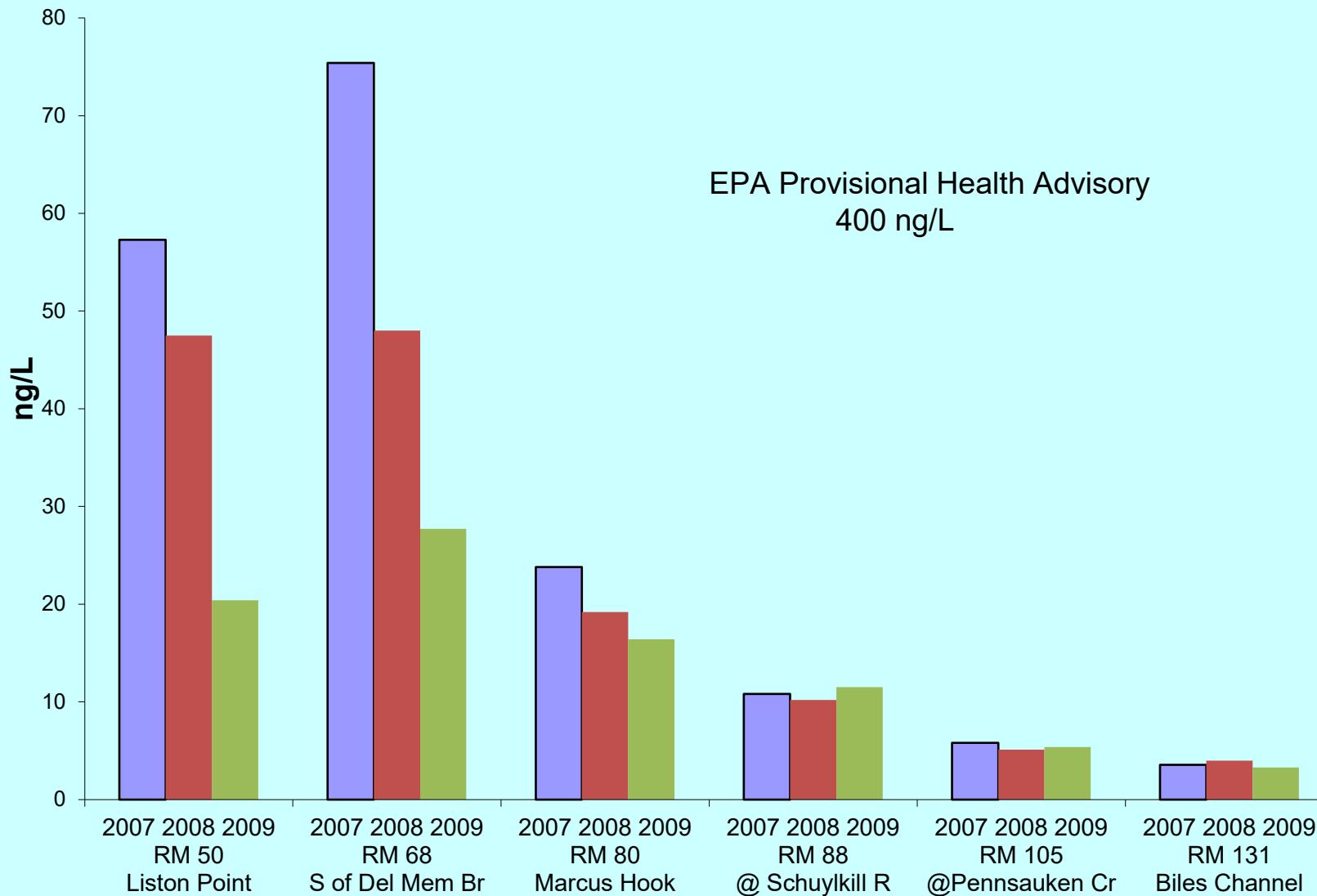


Perfluorinated Carboxylates In Ambient Waters Of The Tidal Delaware River 2009

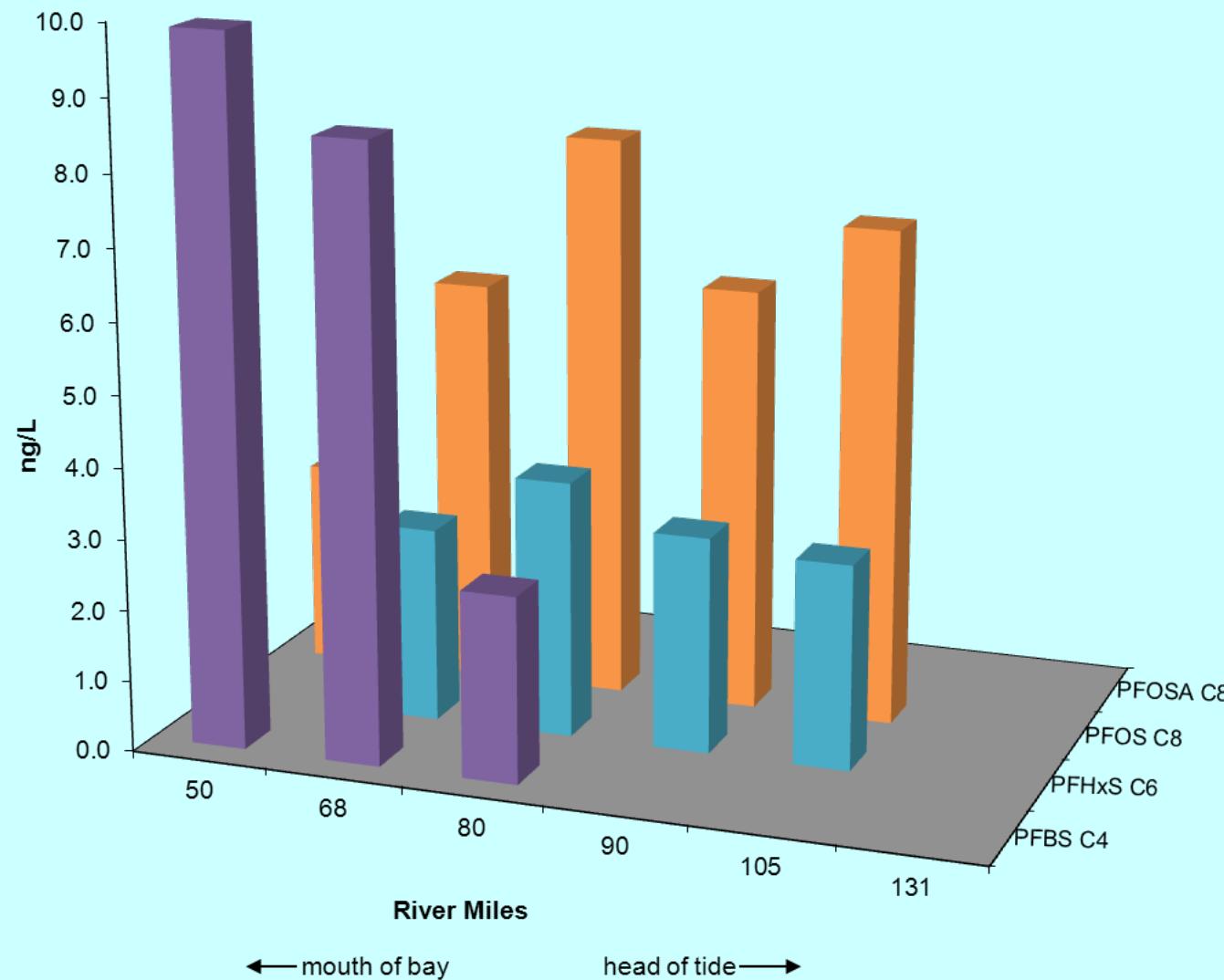




PFOA In Ambient Water Of The Tidal Delaware River

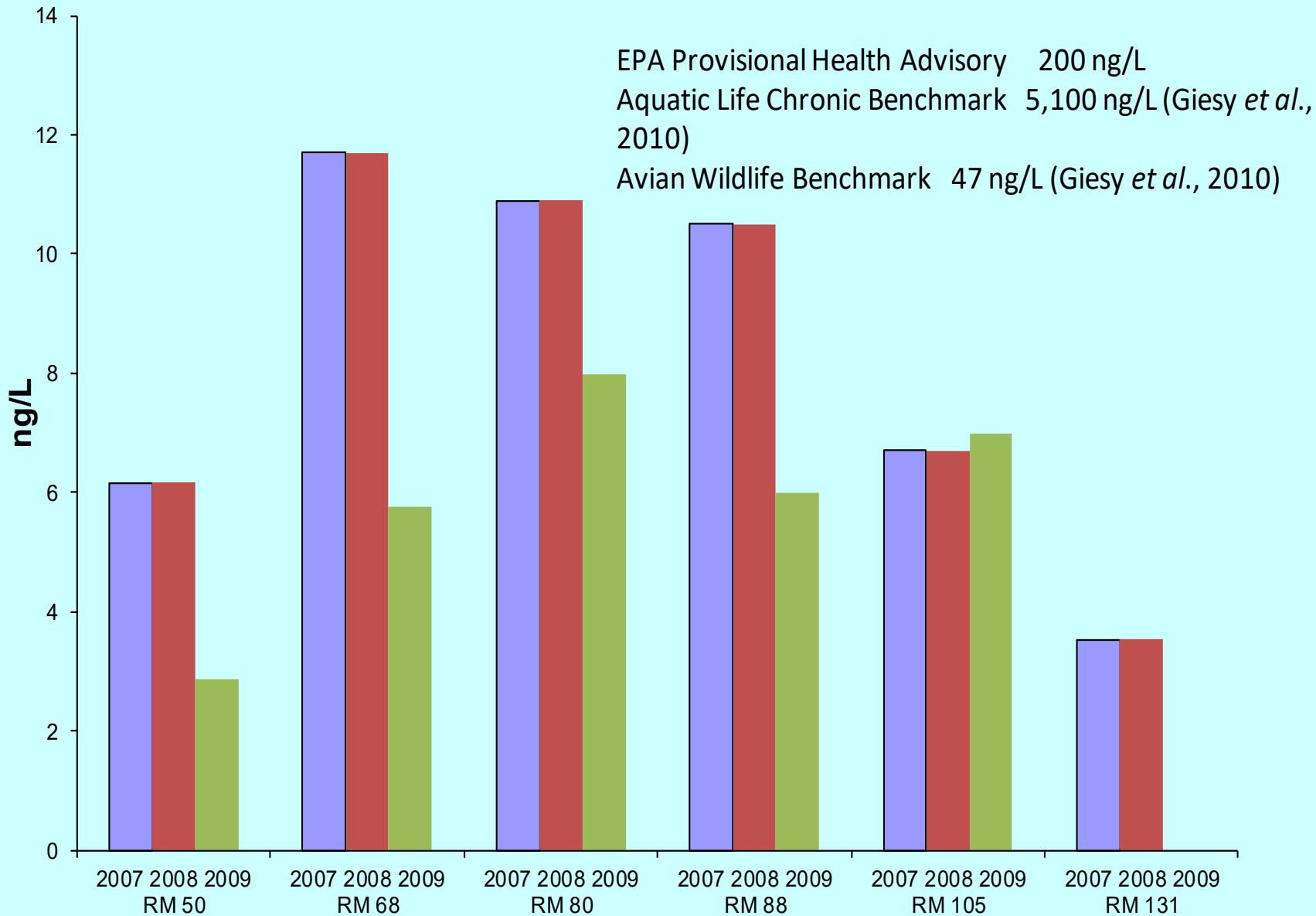


Perfluorinated Sulfonates In Ambient Waters Of The Tidal Delaware River 2009





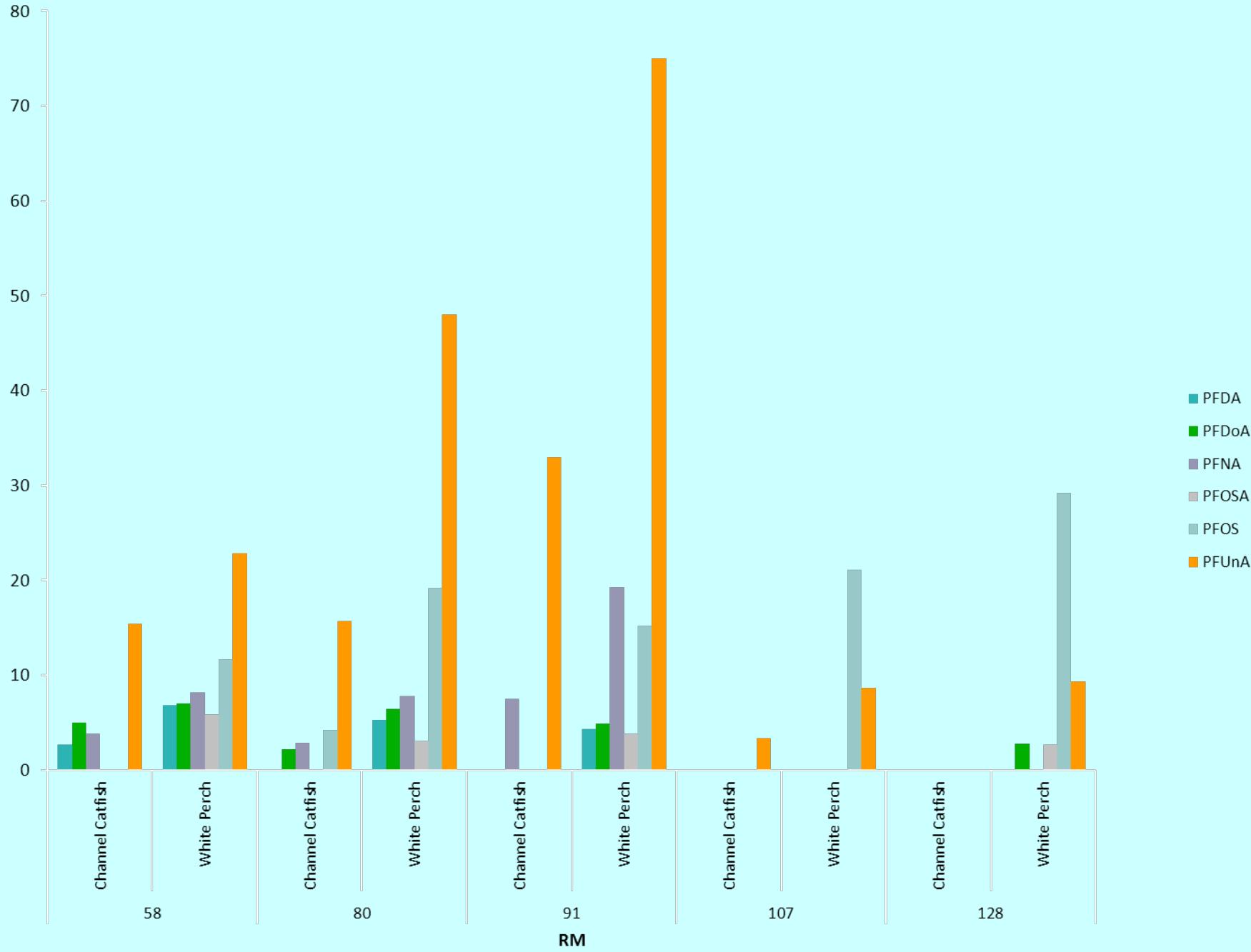
Perfluorooctane sulfonate (PFOS) In Ambient Water Of The Tidal Delaware River





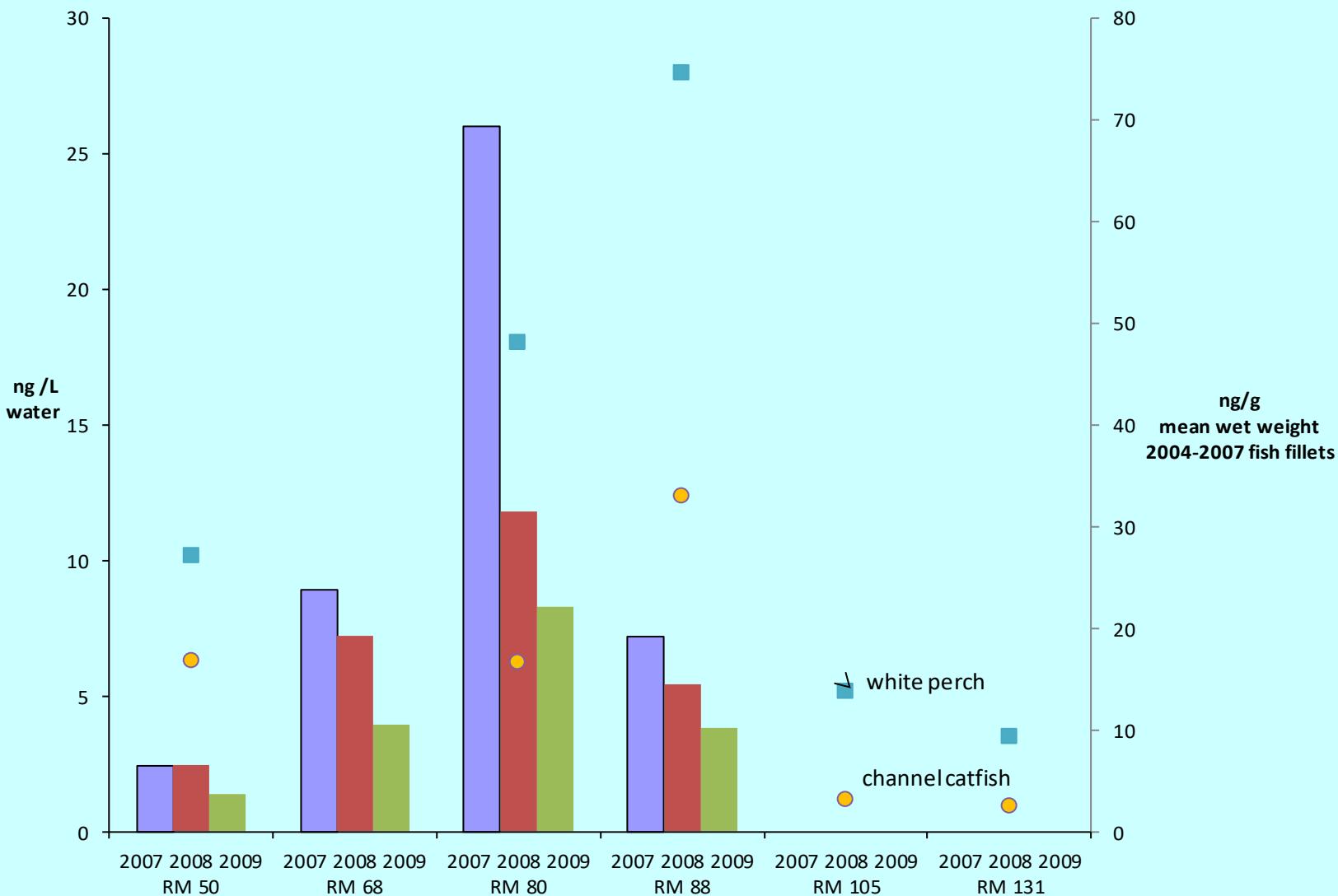
Fish Fillet 2004 to 2007

mean ng/g wet weight





PFUnA (C11) In The Tidal Delaware River





Summary – Perfluorinated Compounds

- PFC detected at ng/L (pptr) levels in water
 - PFNA (C9) highest PFC concentrations in water
 - Concentrations in water appear to be going down
- PFC in Delaware River fish fillets at ng/g (ppb) levels
 - PFUnA(C11) > PFOS(C8) > PFNA(C9) > PFDoA(C12) > PFDA(C10)
- Additional ecotoxicology information needed especially on the bioaccumulative and persistent longer chain and sulfonated compounds



Report Technical Reviewers

- Dr. Thomas Fikslin, DRBC
- Dr. Robert Hoke, Dupont Haskell Lab
- Dr. Richard Greene, DNREC
- Dr. Daniel Caldwell, J&J – hormone section
- Dr. Jeffrey Ashley, Phila U. – PBDE section
- Dr. Franklin Houghton, U Pitt – estrogenic cpd assay section
- Greg Cavallo PG, DRBC - data management and review
- Report distributed to TAC members